MAINSTREAMING OF BIODIVERSITY IN THE WATER MANAGEMENT SECTOR

The Case of the Brague Demonstration Site in Southern France

Case highlights

Nature-based solutions (NbS) for flood risk mitigation in the Brague catchment are economically more beneficial than traditional grey engineering solutions. This is largely caused by the co-benefits associated with NbS.

Flash floods cannot entirely be avoided by upstream measures in this type of river basin so downstream spatial planning measures are needed in support of nature-based solution to create sufficient room for the river. This requires involvement of a broad group of stakeholders.

Issue addressed

The Brague basin measures 61 km², and combines rural headwaters, a forested central part and urban lowlands on the French Riviera. On 3rd October 2015, severe rainfalls triggered dramatic flash floods, statistically representing a 1 in 100 years magnitude. Twenty people died, about € 550-650 million in losses were observed, as well as cascading complications on transportation, communication and energy networks. Flooding was seriously worsened by tree trunks blocking bridges and culverts.

Climate change affects the seasonal variability of droughts and precipitation, challenging (fresh) water management across Europe. The flood event has therefore been used for an in-depth study of torrential flood hazards and risks, the effects on ecosystems, and the effectiveness of nature-based flood solutions as compared to traditional engineering approaches.

Approach followed

The impacts of classic “grey” solutions for flood mitigation strategies were assessed against NbS. The grey solution included huge retention dams, concrete channels and measures to avoid bridges becoming obstructed with trees and debris. NbS combine retention measures that give room to the river by creating small natural water retention areas in the upper catchment and widening the river corridor in the lowlands, enhanced by floodplain works including bed and bridge widening, maintaining of a forest corridor, wetlands restoration, and debris management. They are integrated in a so-called “giving-room-to-the-river” strategy.

An analysis of flood risk showed that forest wildfires significantly aggravate floods. However, although wildfire hazards are high to very high in this region, wildfires are seriously limited by the existing efficient firefighter organization. Only during extremely dry and hot summers may they be overwhelmed and large scale fires may occur, aggravating run-off and erosion during a few years until nature has restored itself.

Benefits obtained

The role of large wood in flood hazard is a particular source of concern. An importantg message is that clogging of bridges by tree trunks cannot be dealt with by annual forest management (removing dead and tilting trees). Such management has been caried out for 20 years and nonetheless more than 3000 trees were found downstream during the 2015 flood, mostly living, healthy trees. The flood event simply was too extreme. The relevant and cheaper solution over the long term is to implement large wood-trapping facilities upstream of bottleneck sections (bridges, dams) and to leave the streams in the upstream section untouched. This is cheaper, more efficient and more sustainable, and better for nature.

Flood modelling demonstrates that the traditional engineering techniques such as retention basins and channelization of water courses are not capable of coping with extreme events such as the October 2015 flood. The broader message is that in rivers hit by large-scale Mediterranean thunderstorms, even a high level of ambition on retention measures in the upper and mid-catchment is insufficient to prevent flooding of downstream floodplains. Therefore, a sufficiently large corridor must be maintained so that such rivers can convey water.

Protecting built up areas may become extremely expensive or even impossible. Building such vulnerable assets should be avoided. Large corridors are most resilient, sustainable and provide numerous co-benefits, but require a long-term land-use strategy which has to be accepted by all local stakeholders.

In the Brague case, NbS solutions were found to have lower costs of implementation than grey solutions for the same level of risk reduction. However, the economic benefits arising from the reduced flood damage are not sufficient to fully cover the investment, maintenance and opportunity costs. It is the co-benefits of NbS that makes the measures economically interesting.

Nature-based solutions for water-related risks can thus not automatically be assumed to be economically efficient. There is a need for an economic evaluation to identify the most suitable strategy in a context of limited public funding. The largest share of the value of NbS comes from their co-benefits, which has implications for the funding of NbS and the need to maximise co-benefits in their design. Apart from reducing peak flows and flood risks, co-benefits in the Brague catchment included climate change adaptation; reduction of drought risk; improving resilience of infrastructure and local populations; better protection of coastal ecosystems.

Best practice lessons

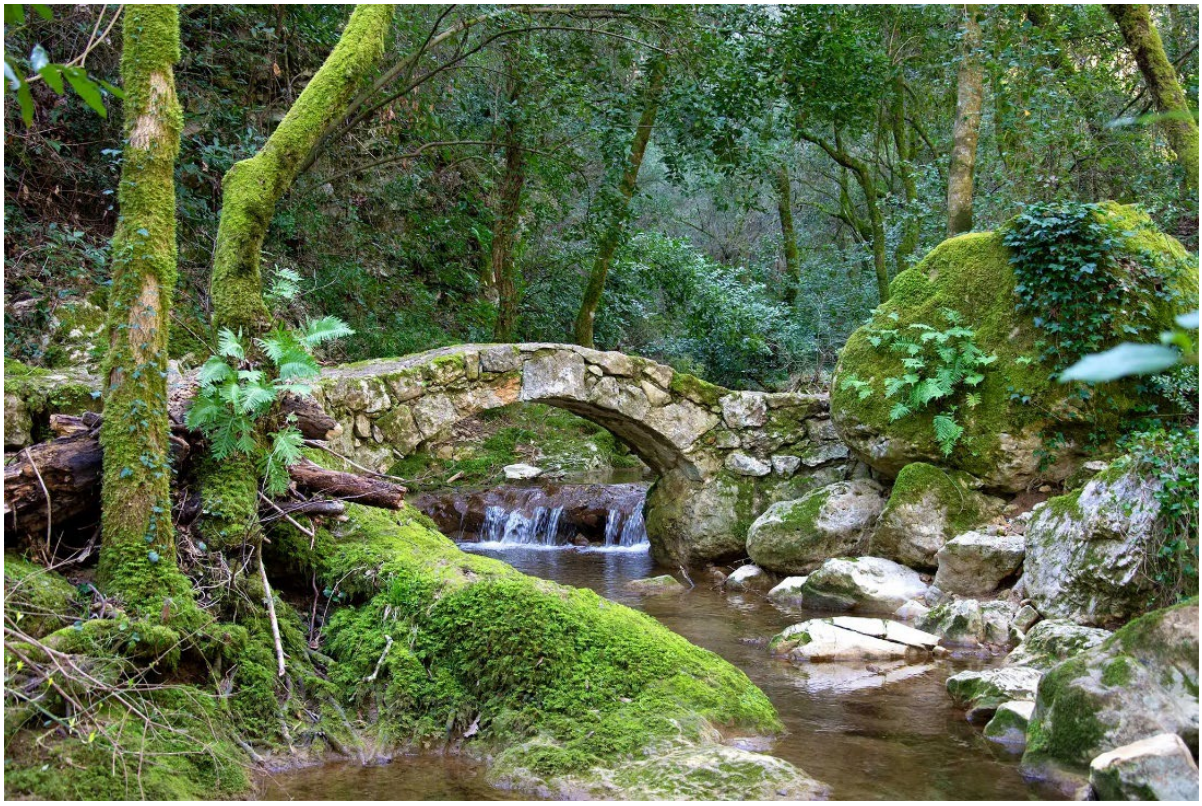
It is essential to build and choose solutions on strong physical evidence, accepted and understood by traditional (technical) flood risk managers, but also to consider other environmental and social features and to make them accepted and implemented by stakeholders, preferably through a participatory approach.
Forests (including riparian forests) have recognized positive effects on hydraulics, ecological habitats preservation, etc. However, they remain vulnerable to wildfires which may induce increased flood risks. Good fire prevention and control institutions are thus part of the nature-based solution.
For rivers basins in the Mediterranean hit by thunderstorms, even high ambition on retention measures in the upper and mid-catchment can be insufficient to prevent flooding. Therefore a sufficiently large corridor (floodplains) must be maintained to convey flows. Such corridors can be natural but also allow for flood resilient activities (e.g. grazing or annual crops), but buildings should be avoided.

Elsewhere: *DRAVA LIFE (2015-2014) – Integrated management of rivers in Croatia*

The Drava is one of the last semi-natural rivers in Central Europe. Hydropower development has left only a small free-flowing section, mostly in Croatia, with a length of 310 km, including 4 Natura 2000 sites. Key natural features of the riverine ecosystem are restored to showcase this innovative approach of river management. The restoration encompasses the opening of new side-arms, removal of embankments and groins, as well as the preservation of retention areas and natural steep river banks. This will benefit endangered habitats and species within Natura 2000 sites. Furthermore, the restoration is favourable for flood control by lowering high water levels locally, and diverting water away from settlements, bridges, roads and dikes. Climate resilience of floodplains will be enhanced by increased infiltration of river water and higher groundwater levels. Recreational opportunities for local inhabitants will increase. Extensive awareness raising activities will be organized in cooperation with local citizens and schools.

Additional information

- Case: *NAIAD Case Studies: Brague Demonstration site (France)*;
- EEA: *NbS in Europe for climate change adaptation and disaster risk reduction*
- UNEP: *Ecosystem based adaptation. Selected cases from Africa*
- EWN: *Engineering With Nature® An Atlas* (118 examples from around the globe)



https://news.sky.com/story/flash-floods-on-french-riviera-up-to-17-dead-10344247